

CLAIMS

- 1 1. An optical fiber terminator comprising:
 - 2 a) a body exhibiting a substantially uniform
 - 3 refractive index n_b ;
 - 4 b) an input interface for admitting a light beam
 - 5 from an optical fiber into said body;
 - 6 c) a concave reflective surface provided in said
 - 7 body opposite said input interface for receiving
 - 8 said light beam and reflecting said light beam
 - 9 along a near-normal direction;
 - 10 d) a convex toroidal reflective surface provided in
 - 11 said body for receiving said light beam reflected
 - 12 by said concave reflective surface and reflecting
 - 13 said light beam along an off-normal direction;
 - 14 and
 - 15 e) an output surface for out-coupling said light
 - 16 beam.
- 17
1 2. The optical fiber terminator of claim 1, wherein
 - 2 an azimuth angle between said near-normal
 - 3 direction and said off-normal direction taken
 - 4 about a rotation axis that connects the point of
 - 5 incidence of said light beam on said concave
 - 6 surface to the point of incidence of said light
 - 7 beam on said convex surface is less than 90
 - 8 degrees.
- 9
1 3. The optical fiber terminator of claim 1, further
 - 2 comprising a folding mirror surface for
 - 3 reflecting said light beam within said body.
- 4

- 1 4. The optical fiber terminator of claim 3,
2 wherein said folding mirror surface is
3 coated by a reflecting material.
4
- 1 5. The optical fiber terminator of claim 3,
2 wherein said folding mirror surface
3 comprises a light-conditioning element.
4
- 1 6. The optical fiber terminator of claim 1, wherein
2 said input interface is a surface located
3 adjacent said convex toroidal reflective surface.
4
- 1 7. The optical fiber terminator of claim 1, wherein
2 said concave reflective surface is a concave
3 toroidal reflective surface.
4
- 1 8. The optical fiber terminator of claim 7,
2 wherein said convex toroidal reflective
3 surface and said concave toroidal reflective
4 surface are adjusted to mutually cancel
5 wavefront distortions in said light beam.
6
- 1 9. The optical fiber terminator of claim
2 8, wherein said convex toroidal
3 reflective surface and said concave
4 toroidal reflective surface are
5 dimensioned to collimate said light
6 beam.
7
- 1 10. The optical fiber terminator of claim
2 8, wherein said convex toroidal
3 reflective surface and said concave

4 toroidal reflective surface are
5 dimensioned to focus said light beam.

6

1 11. The optical fiber terminator of claim 1, wherein
2 said body comprises a molding material having a
3 substantially uniform coefficient of thermal
4 expansion.

5

1 12. The optical fiber terminator of claim 11,
2 wherein said molding material is an organic
3 polymer.

4

1 13. The optical fiber terminator of claim 11,
2 wherein said molding material is a glass.

3

1 14. The optical fiber terminator of claim 1, wherein
2 said concave reflective surface and said convex
3 toroidal reflective surface are coated by a
4 reflecting material on the surface of said body.

5

1 15. The optical fiber terminator of claim 14,
2 further comprising an optical monitor
3 coupled to said body for monitoring the
4 intensity of said light beam.

5

1 16. The optical fiber terminator of claim
2 15, wherein said optical monitor is
3 coupled to one of said concave
4 reflective surface and said convex
5 toroidal reflective surface.

6

1 17. The optical fiber terminator of claim 1, further
2 comprising a light-conditioning element in said
3 body for conditioning said light beam.

4
1 18. The optical fiber terminator of claim 17,
2 wherein said light conditioning element is a
3 coating selected from the group consisting
4 of wavelength-filtering coatings, anti-
5 reflection coatings, and polarization-
6 altering coatings.

7
1 19. The optical fiber terminator of claim 17,
2 wherein said light conditioning element is a
3 grating.

4
1 20. The optical fiber terminator of claim 1, further
2 comprising a light-conditioning element on a
3 surface of said body for conditioning said light
4 beam.

5
1 21. The optical fiber terminator of claim 20,
2 wherein said light conditioning element is a
3 coating selected from the group consisting
4 of wavelength-filtering coatings, anti-
5 reflection coatings, and polarization-
6 altering coatings.

7
1 22. The optical fiber terminator of claim 20,
2 wherein said light conditioning element is a
3 grating.

4

- 1 23. The optical fiber terminator of claim 1, wherein
2 said input interface is a surface of said body.
3
- 1 24. A monolithic fiber terminator array comprised of
2 a number of optical fiber terminators of claim 1.
3
- 1 25. An apparatus for manipulating light comprising:
2 a) a body exhibiting a substantially uniform
3 refractive index n_b ;
4 b) an input interface for admitting a light beam
5 into said body;
6 c) a concave reflective surface provided in said
7 body opposite said input interface for receiving
8 said light beam and reflecting said light beam
9 along a near-normal direction;
10 d) a convex toroidal reflective surface provided in
11 said body for receiving said light beam reflected
12 by said concave reflective surface and reflecting
13 said light beam along an off-normal direction;
14 and
15 e) an output surface for out-coupling said light
16 beam.
17
- 1 26. The apparatus of claim 25, wherein an azimuth
2 angle between said near-normal direction and said
3 off-normal direction taken about a rotation axis
4 that connects the point of incidence of said
5 light beam on said concave surface to the point
6 of incidence of said light beam on said convex
7 surface is less than 90 degrees.
8

- 1 27. The apparatus of claim 25, further comprising a
2 folding mirror surface for reflecting said light
3 beam within said body.
4
- 1 28. The apparatus of claim 25, wherein said input
2 interface is a surface located adjacent said
3 convex toroidal reflective surface.
4
- 1 29. The apparatus of claim 25, wherein said concave
2 reflective surface is a concave toroidal
3 reflective surface.
4
- 1 30. The apparatus of claim 25, wherein said body
2 comprises a molding material having a
3 substantially uniform coefficient of thermal
4 expansion.
5
- 1 31. The apparatus of claim 25, wherein said concave
2 reflective surface and said convex toroidal
3 reflective surface are coated by a reflecting
4 material on the surface of said body.
5
- 1 32. The apparatus of claim 25, further comprising a
2 light-conditioning element in said body for
3 conditioning said light beam.
4
- 1 33. The apparatus of claim 25, further comprising a
2 light-conditioning element on a surface of said
3 body for conditioning said light beam.
4
- 1 34. The apparatus of claim 25, wherein said input
2 interface is a surface of said body.

3
1
2
3
1
2
3
1
2
3
1
2
3
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

35. A monolithic array comprised of a number of apparatus of claim 25.
36. A free space communication system comprising the apparatus of claim 25.
37. A telescropy system comprising the apparatus of claim 25.
38. A method for receiving and guiding a light beam, said method comprising:
- a) providing an optical fiber terminator having a body exhibiting a substantially uniform refractive index n_b ;
 - b) admitting said light beam into said body via an input interface;
 - c) providing a concave reflective surface in said body opposite said input interface for receiving and reflecting said light beam along a near-normal direction;
 - d) providing a convex toroidal reflective surface in said body for receiving said light beam reflected by said concave reflective surface and reflecting said light beam along an off-normal direction; and
 - e) out-coupling said light beam via an output surface of said body.